SOLVAY
SODA ASH JOINT VENTURE

January 29, 1998

Dan Olson
Administrator DEQ-Air Quality Division
122 W. 25th St.
Cheyenne, Wyoming 82002

RE: AP-W77 Permit Analysis

Dear Mr. Olson:

Solvay Soda Ash Joint Venture (Solvay) has reviewed the AP-W77 permit evaluation and proposed permit conditions. Attached you will find copies of the pages of the evaluation that have minor corrections. Following is clarification on the analysis and a comment concerning the proposed Permit Condition #12.

The statement "From plant testing on other similar sources, Solvay has predicted that total VOC emission from trona based emissions will be negligible for this baghouse." is found throughout the analysis. This statement was made not only for trona based sources, but is also noted under coal, soda ash, and sulfite sources. To clarify, Solvay has found through testing that VOC emissions are associated with the calcination of trona ore, with negligible amounts emitted from raw trona handling sources. The volatile organics associated with the trona ore are emitted in significant amounts only during the calcination process. Therefore, sources associated with products other than calcined trona will have negligible trona-related VOC emissions.

Solvay agrees with the intent of Condition #12, to use opacity as an indication of particulate emission rates. However, there are a number of points that must be considered:

- ✓ There is evidence that at low opacity readings, as expected for proposed sources AQD #s 80 and 82, there is little correlation between opacity and particulate emission rates.

- ✓ Opacity monitors are required to be within plus or minus four percent (4%) opacity on a 24-hour basis. As noted in 40 CFR Part 60.12(d)(1), "The zero and span shall, as a minimum, be adjusted whenever the 24-hour zero drift or 24-hour span drift exceeds two times the limits of the applicable performance specifications in appendix B." The applicable performance specifications are

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≤ two percent (2%) opacity. This allowed variability, coupled with the expected low opacity readings of proposed AQD #s 80 and 82, may not allow an accurate correlation of particulate emission rates to opacity.

✓ The goal of the Compliance Assurance Monitoring (CAM) rule is to assure compliance by maintaining pollution control devices. Performance tests will be correlated to operating parameters of the control devices, to establish a range of operation allowed, while assuring compliance. These parameters will then be used to indicate compliance status. An operating parameter, other than opacity, may be a more representative indicator of compliance. The proposed Condition #12 will be better addressed by CAM regulations than by this construction permit.

✓ There are no New Source Performance Standards (NSPSs) applicable to AQD #s 80 and 82. However, the strictest NSPS opacity limit is seven percent (7%), applicable to Subpart OOO sources. If Condition #12 is imposed, Solvay suggests that the opacity limit be set no lower than seven percent (7%).

If you have any questions, do not hesitate to contact me at (307) 872-6571.

Sincerely,

Dolly A. Potter
Environmental Engineer

Enclosure

cc: Bernie Dailey
Lee Gribovicz

PURPOSE OF APPLICATION:

Solvay is proposing to expand their soda ash (sodium carbonate) production capacity at their Green River Plant by approximately 1.2 million tons per year; from a current 2.40 MM TPY, up to a total 3.6 MM TPY. This production increase will be accomplished by constructing a full new trona processing and soda ash production train, the fourth such train at the facility. This new process line will be identified as "D" train.

Major equipment proposed for the project includes a new 50,000 ton covered ore storage building; the addition of new primary cone crusher and screening loop equipment; a 400 MM Btu/hr natural gas fired calciner; a 200 MM Btu/hr natural gas fired dryer; associated dissolving, filtering and evaporating equipment; a 100 MM Btu/hr natural gas fired boiler, and two new 10,000 ton (325,000 ft^3) capacity soda ash product storage silos. Also, the existing mine ventilation shaft will be converted to a second ore production shaft under this expansion, requiring drilling of a third shaft for the revised mine ventilation system.

Process Description

This plant produces soda ash product (sodium carbonate chemical: Na_2CO_3) from trona ore (sodium carbonate/bicarbonate mineral: $Na_2CO_3 \cdot NaHCO_3 \cdot 2H_2O$), mined underground at the plant site. Current Wyoming Air Quality permits limit this plant to 2.4 MM TPY of soda ash production from no more than 3.8 MM TPY of trona ore. There currently are three separate processing units on plant, identified as the "A", "B" and "C" process trains, respectively. The "D" process train will follow conventional monohydrate soda ash production techniques, using the same basic production steps as the existing three units as described below.

Trona ore is mined underground at the site, hoisted to the surface and then conveyed to a building housing the primary screen. A new mining technique will be implemented at Solvay as part of this expansion, known as "long wall" mining. Ore from long wall mining is expected to be produced in larger size pieces, therefore Solvay is adding a new primary screening and cone crushing loop to the process as part of this expansion.

At the primary screen, run-of-mine (ROM) trona ore is separated into three fractions, with the largest pieces (> 3") recycled to the new primary cone crusher. The fine fraction (< ~~¾~~ 5/16") goes directly to process, while the remaining mid-size fraction goes to a splitter where it can either go to secondary crushing, or to one of two enclosed ore storage buildings. The existing East Storage Building has a capacity of 90,000 tons, while the West Storage Building (to be constructed under this permit), is sized at 50,000 tons.

Trona reclaimed from ore storage, or mid-size fraction conveyed directly from the splitter, is sent to one of ~~four~~ three hammermill secondary crushers in the main crusher building to produce pea size (< 5/16") refinery feed. The mined trona ore is composed of approximately ~~85-90%~~ 88-94% trona mineral, with the remainder consisting primarily of sand and shale. Thus after crushing, the ore must be conveyed to the refinery process buildings for removal of these insoluble contaminants.

The first half of the process takes place in the **calciner/dissolver end**, where trona is chemically converted to sodium carbonate (process called calcining) and then dissolved in water to form "liquor". Calcining takes place in direct gas-fired rotary kilns, where the heat drives off the bicarbonate CO_2 and the water of hydration in the trona crystal. The calcined ore from the kiln outlet spill point

is then dissolved in weak soda ash liquor, forming a strong soda ash solution of the soluble sodium carbonate.

The insoluble rock is left behind in the dissolution process, being separated from the liquor in a series of settling and filtering steps. The largest sand/shale particles drop out in a tank and are pulled out by a piece of equipment called a rake classifier. Then the liquor is fed to thickener tanks where the smaller particles settle and can be removed. Finally, the liquor passes through pressure filters to remove the last traces of solid residue.

In addition to insoluble rock, the trona ore is also contaminated with organic matter in varying degrees. This varying organic level causes the trona crystals to appear in color ranging from clear, through shades of yellow, and on to dark brown "root beer" trona. Thus the soda ash liquor also picks up this yellow tint, which must be removed to produce the desired product purity. Activated carbon is used to remove these organics, with this carbon being mixed in powdered form into the soda ash liquor prior to completing pressure filtering. The carbon adsorbs the soluble organic impurities, removing the "color" from the liquor, and the used carbon is picked up with other insolubles in the ~~last of the~~ filters.

The second half of the process takes place in the **evaporator/dryer end**, where the soda ash liquor is concentrated in steam heated triple-effect evaporators to drive off excess water from the liquor, producing purified soda ash crystals. The wet soda ash crystals are centrifuged to dewater them, and then the crystals are conveyed to dryer kilns. "A" and "B" trains have steam tube design dryers, while "C" and "D" trains utilize direct gas-fired rotary kilns. These dryers drive off the remaining free moisture, leaving the final granular soda ash product falling to conveyors at the spill end of the dryer units.

The product is then screened to remove oversize particles, and conveyed to storage silos to await shipment by bulk truck, bulk rail, or in bags. Existing storage capacity includes two 10,000 ton (325,000 ft^3) silos, and four 7,000 ton (225,000 ft^3) silos. Two additional 10,000 ton silos are proposed under this application.

Utility steam is provided for ~~electricity generation and~~ process heat by two 350 MM Btu/hr coal fired **process boilers**. Solvay will install an additional 100 MM Btu/hr natural gas fired boiler under this application, primarily to supply heat for the mine air ventilation system.

Project Emission Sources

Solvay's application indicates that there will be seven new emission points constructed under this project. The major process emission sources will include **(1)** an electrostatic precipitator on the exhaust of the new gas fired calciner (AQD #80), and **(2)** another electrostatic precipitator on the exhaust of the gas fired soda ash dryer (AQD #82). There will also be four housekeeping dust control systems, utilizing baghouses to capture dust from dry ore and soda ash conveyor handling and processing activities. These four systems are identified as AQD #'s 76, 79, 81 and 83. Finally, there will be a new 100 MM Btu/hr capacity natural gas fired boiler installed, identified as AQD #85, primarily for heating mine ventilation air.

In addition, Solvay intends to modify the existing "A", "B" and "C" calciners to increase their design short term production capacity from 162, up to 200 TPH trona feed. This increased capacity will be accomplished by replacing the existing drag conveyors on the spill end of the kilns, with new higher speed bucket elevators

allowing more product removal capacity. Solvay feels that the firing capacity of these three existing calciners is sufficient to adequately calcine the increase trona ore throughput.

Another change planned under this project is the removal of the AQD #2b baghouse that currently services the East Storage Building ore reclaim system. AQD #46, another baghouse control system is located in the vicinity of the East Storage ore reclaim, and Solvay feels that this system has the capacity to absorb the load of the existing ore reclaim pick-up points. Thus Solvay will modify the AQD #46 industrial ventilation system to include these former AQD #2b system hoods.

AQD #47 baghouse control system, the control device for collecting dust emissions from the existing three hammermill crushers, will also be eliminated as part of this project. Solvay has excess capacity in the AQD #2a baghouse, and by modifying the industrial ventilation system of #2a, they intend to control the emission points from the existing three hammermills with this system. The #2a fan will not be changed, however, and that fan's exhaust air volume will simply be re-apportioned throughout the modified collection ductwork. With the same projected exhaust volume, the existing source #2a particulate emission rate will remain at the current level.

Also part of this project, Solvay plans to reduce permitted emissions in eleven existing plant baghouses by changing the basis on which the allowable limits are set. Solvay had estimated emissions from AQD #'s 6b, 10, 11, 14, 41, 44, 46, 64, and 65 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set on this basis in past permits. In this current application, Solvay is proposing to reduce the allowable for these nine sources to 0.01 gr/dscf. The emissions on two other units, AQD #50 "C" train dryer housekeeping and AQD #53 product silo reclaim baghouses, will do even better at 0.005 gr/dscf.

As additional trade-off for new particulate emissions, Solvay will reduce the permit limit on the two existing coal boilers (AQD #18 & 19) from 17.0, down to 5.0 pph (0.0056 gr/dscf) based on recent internal testing and evaluation of control equipment capability by the Solvay technical staff.

Also based on testing results, Solvay will reduce the permit limit on four process dryers (AQD #15, #26, #51 & #73). The particulate allowables for AQD #15 common stack for the "A" & "B" line steam tube dryers' ~~electrostatic precipitators~~ wet scrubbers, and the AQD #73 meta-bisulfite dryer scrubber stack, will both be based on 0.015 gr/dscf. Mass emission test results on the AQD #26 Alkaten product dryer baghouse stack show it to operate below 0.006 gr/dscf, while the mass values for the AQD #51 "C" line gas fired dryer electrostatic precipitator stack work out to 0.008 gr/dscf outlet loading.

In another particulate trade-off measure, Solvay will commit to limiting operation of three coal handling baghouses (AQD #'s 10, 11 & 14), and one caustic lime delivery baghouse (AQD#44) to no more than 12 hours per day. These systems control emissions from coal or lime deliveries, which occur intermittently, only during the daytime hours.

Under May '96 permit MD-282, Solvay had permitted expansion of their existing sodium sulfite plant to include a meta-bisulfite (MBS) product variant, along with construction of a new combined product bagging facility. That permit considered installation of four product storage silos for the bagging machine feed, one for each of four products (MBS, sodium sulfite, Alkaten, and soda ash), with a bin vent baghouse assigned to each silo. Solvay subsequently decided that the new soda ash silo could be serviced by the existing AQD #53 main soda ash silo storage vent

baghouse control system, thus the new planned bin vent for the bagging soda ash silo was no longer required. Therefore the MD-282 permitted source, AQD #69, was never built, and this analysis acknowledges removal of that source from the Green River plant emission inventory.

In addition to the elimination of AQD #69, Solvay recently notified the Division of other changes to the actual configuration of emission sources constructed under the MD-282 permit (5/29/97 letter). These changes included abandoning the former AQD #40 sulfite bagging system, and relocating that old baghouse for service on the new AQD #72 MBS process soda ash feed bin. Stack exhaust volume was revised for the product loading storage silo bin vents (AQD #'s 68, 70, 71 & 72), and as above, Solvay reduced allowable emissions from 0.02, down to 0.01 grains per dry standard cubic foot of exhaust (gr/dscf) for these four sources. The Division acknowledged that the MBS/bagging system revision proposal resulted in reduced potential emissions (6/27/97 letter), and informed Solvay that the allowable emission changes would be codified in this permit. Thus the emission calculations of this permit also incorporate these changes to the "Bagging Facility/MBS Plant".

This permit will also acknowledge the existence of nitrogen oxide and volatile organic compound emissions, from a small natural gas burner on the AQD #26 Alkaten product dryer. This source has existed since its installation under July '86 permit CT-643A, but identification of NO_x and VOC emissions from the source was just recognized in the preparation of this current application.

Solvay has also corrected the system exhaust volumes (flow rates) of a number of existing emission sources. These corrections are identified in the individual descriptions of existing sources modified under the application.

Finally, this application will formally consider the existence of VOC emissions from the mine vent system. The mine vent has existed at the plant from its inception, but it has only recently been determined such vents are the source of significant emissions. As noted previously, under this project Solvay will drill a new shaft for the revised mine configuration ventilation system, however emissions are not expected to vary significantly from the existing vent shaft.

REPORTED PROCESS RATES: → anhydrous

As indicated above, this expansion will produce approximately 1.2 million tons per year of ~~monohydrate~~ soda ash (137 TPH dryer production average for full year, 8760 hours operation). To yield that tonnage, the existing three calciners will each process a maximum of 200 TPH of trona ore, while the new "D" calciner will be designed for 275 tons per hour ore feed.

Solvay's maximum hourly process rates after completion of this expansion project are shown in Table A, along with a comparison between the annual production at full load, full year (8760 hrs) operation and the design capacity sought through the permit application.

Table A: Solvay Design Process Rates

Unit	Calciner Kilns: Trona Ore Feed Rate (TPH)	Calciner Kilns: Calcined Ore Production Rate (TPH)	Trona Ore Feed Rate Capacity @ Full Load (MMTPY)	Design Annual Trona Ore Feed Rate (MMTPY)
#17 "A" Calciner	200	147	1.752	1.577
#17 "B" Calciner	200	147	1.752	1.577
#48 "C" Calciner	200	147	1.752	1.577
#80 "D" Calciner	275	202	2.409	2.048
Totals	875	643	7.665	6.779

Unit	Dryer Kiln: Wet Crystal Feed Rate (TPH)	Dryer Kiln: Soda Ash Production Rate (TPH)	Soda Ash Production Capacity @ Full Load (MMTPY)	Design Annual Soda Ash Production (MMTPY)
#15 DR-1 Dryer	93	76	0.666	0.594
#15 DR-2 Dryer	93	76	0.666	0.594
#28 DR-4 Dryer	40	32	0.280	0.252
#51 DR-5 Dryer	150	122	1.069	0.962
#82 DR-6 Dryer	198	161	1.410	1.199
Totals	~~563~~ 574	~~458~~ 467	4.091	3.601

POLLUTANTS EMITTED:

Particulate matter (TSP/PM_{10}), nitrogen oxides (NO_x), carbon monoxide (CO) and volatile organic compounds (VOC's) are the major pollutants that will be emitted as a result of this project.

Regarding particulate, the stack emission control equipment is not 100% efficient at catching dust, therefore some particulate matter will be emitted in the form of trona or soda ash dust from the stacks of the trona calciner, the soda ash dryer, and from the housekeeping baghouses constructed under this project.

NO_x will be the primary pollutant coming from combustion of natural gas in the trona calciner, the soda ash dryer and the new 100 MM Btu/hr boiler. Carbon monoxide (CO) is also emitted from natural gas combustion, but because ambient standards are so much higher for this pollutant, it is not as important an emission in this analysis. Also emitted from natural gas combustion are trace amounts of unburned hydrocarbon fuel that slips through the burners, and the combustion products of fuel impurities such as ash and sulfur. The ash and sulfur content of the natural gas fuel is negligible and will result in inconsequential emission rates of particulate matter and sulfur dioxide. Carbon dioxide, the product of complete carbonaceous fuel combustion, will also be emitted from natural gas combustion, but CO_2 is not considered a pollutant of local concern at this point in time.

Volatile organic compound emissions (VOC's = non-methane, non-ethane organic compounds) have been found to be emitted from various trona processing operations, driven off from organic contaminants in the trona ore. The VOC emission components

possibly originate from the oil shale that is mined around the edges of the trona ore deposits, or from organic contaminants within the trona ore, itself. The VOC's may contain individual pollutant species which are listed under Title III of the U.S. Clean Air Act Amendments of 1990, as hazardous air pollutants (HAP's).

Finally, there will be emissions coming from the mine air vent system, as VOC contaminated exhaust from the mining operation escapes to the atmosphere.

The applicant has reported that testing of the existing calciners has revealed CO, VOC, and HAP emissions due to the calcination process. As reported by the applicant, due to the extreme variability of the emission rates tested and the limited number of samples, a very conservative approach to determine maximum emission rates of these pollutants was utilized. A statistical analysis of stack test results was done to derive the expected average and maximum hourly emissions. The average emission rate was calculated, then to it is added 3 times the standard deviation. Statistically, this result depicts the maximum hourly emission rate with a confidence level of 99.7%.

EMISSION CONTROL MEASURES PROPOSED:

Solvay has not yet made a final selection of the control equipment that will be installed under this project, but they have specified the exhaust rates and emission control that these pieces of equipment will be designed to achieve. As a permit condition, the Division will require that these pieces of control equipment meet the design specifications and comply with the emission limits as considered in this permit analysis. Also Solvay will be required to supply details of the final equipment selection after the alternatives are considered.

Major emission sources proposed in this permit application include:

AQD #80 "D" Train Trona Ore Calciner Precipitator

The new trona calciner will be fired with natural gas, with a design firing capacity of 400 MM Btu/hr. The burner will be designed for "Low NO_x" performance, with a NO_x emission rate of 0.05 lb/MM Btu, or 20.00 pph. At the 275 TPH design trona feed rate of this unit, the process emission factor will be 0.073 lb/ton ore feed.

Solvay is proposing to use an electrostatic precipitator, designated source AQD #80, to control particulate emissions from this calciner stack. The ventilation system will be designed to handle 264,000 actual cubic feet per minute (95,300 dscfm) of exhaust through a 10'6" diameter stack (3,049 ft/min exit velocity). Solvay has certified that this precipitator will meet an outlet particulate loading of 0.015 grains per dry standard cubic foot of exhaust, which works out to 12.25 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has projected maximum VOC emissions from trona based emissions and gas firing, of 1.94 pounds per ton of ore throughput. For the 275 maximum TPH process rate, this works out to 533.50 pph for this calciner.

CO emissions also exist from trona calcining, with some CO coming from the fuel combustion at the kiln burner, and a significant portion coming form partial combustion of the hydrocarbons driven off the trona ore in the hot environment of the calciner kiln. From plant testing on ~~the~~ similar sources, Solvay has projected maximum CO

Thus Solvay is certifying that this boiler will emit no more than 3.80 pounds per hour of NO_x.

Solvay burner manufacturer has also guaranteed CO emissions of 0.09 lb/MM Btu from this boiler, or 9.00 pounds per hour at the 100 MM Btu/hr design firing capacity based on 90 ppmv CO concentration in the exhaust.

The industrial ventilation system fan on this boiler will be designed for 42,000 actual cubic feet per minute (22,275 dscfm) of exhaust air, leading to a 3.0 ft. diameter outlet stack (5,942 ft/min exit velocity). Because it burns only natural gas, Solvay has projected minimal particulate emissions based again on AP-42 emission factors. The Table 1.4-1 emission factor for particulate on "large industrial boilers" is 5.0 lb/MMSCF. At the 96,618 CFH design fuel use rate, particulate emission work out to 0.48 pph for this ~~dryer~~ boiler

Solvay also projected VOC emissions from the boiler based on AP-42 emission factors from Table 1.4-3 for gas firing. At the 2.8 lb/MMCF factor for on "small industrial boilers" (48% of TOC), and 96,618 CFH design fuel use rate, VOC emissions work out to 0.27 pph for this dryer.

Although AP-42 also provides an emission factor for SO_2, the Division is satisfied that the specified sulfur content of normal pipeline gas is trivial and sulfur dioxide emissions are negligible.

Housekeeping emission sources proposed in this permit application include:

and crusher AQD #76 Primary Screening Baghouse → and Crushing

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #76, to collect trona dust from vents associated with the new primary ore screens and the discharge of that system to distribution conveyor belts. This industrial ventilation system fan will be designed for 36,000 actual cubic feet per minute (28,600 dscfm) of exhaust air, leading to a 3'8" ft. diameter baghouse stack (3,409) ft/min exit velocity). Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to 2.45 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #79 Main Crusher Building Hammermill Feed Housekeeping Baghouse

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #79, to collect trona dust from transfer points on the discharge end of the conveyor system carrying the reclaim ore from the West Ore Storage Building to the hammermills in the main crusher building. This industrial ventilation system fan will be designed for 12,250 actual cubic feet per minute (9,800 dscfm) of exhaust air, leading to a 2'1" diameter baghouse stack (3,594) ft/min exit velocity). Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to 0.84 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #81 Soda Ash Dryer Area Housekeeping Baghouse

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #81, to collect soda ash dust from transfer points and screens in the soda ash dryer product handling area of the main process plant. This industrial ventilation system fan will be designed for 10,000 actual cubic feet per minute (5,800 dscfm) of exhaust air, leading to a 1'8" diameter baghouse stack (4,584 ft/min exit velocity). Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to 0.50 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #83 Product Storage Silo Feed Area Housekeeping Baghouse

Solvay is proposing to use a standard baghouse and industrial ventilation system, designated source AQD #83, to collect soda ash dust from bin vents and product transfer points at the top of the two new soda ash storage silos. This industrial ventilation system fan will be designed for 7,500 actual cubic feet per minute (4,750 dscfm) of exhaust air, leading to a 1'8" diameter baghouse stack (3,438 ft/min exit velocity. Solvay has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust, which works out to ~~0.29~~ 0.41 pounds per hour of particulate matter.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

Existing process sources which will be modified under this expansion include:

AQD #15 Dryer 1 & 2 Scrubber Stack

Solvay currently controls particulate emissions on the DR-1 and DR-2 steam tube dryer exhaust streams using twin model 59/126 Type VVO Ducon venturi scrubbers, with the common exhaust stack designated source AQD #15. The industrial ventilation fan for this system is designed for 83,100 actual cubic feet per minute (33,750 dscfm) of exhaust air, leading to a 6 ft. diameter ~~baghouse~~ stack (2,939 ft/min exit velocity). As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #15 scrubber stack by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #15 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 6.80 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this scrubber stack exhaust will meet an outlet emission loading of 0.015 grains/dscf of exhaust. At the currently specified 33,750 dscfm, this works out to a revised allowable particulate emission rate of 4.34 pounds per hour.

The stack also emits NO_x emissions limited to 1.20 pph. From plant testing on other similar sources, Solvay has determined total VOC emissions from this ~~boiler~~ dryer to be fuel related, thus based on AP-42 emission factors, the unit emits 0.06 pph of VOC. No changes are planned for the burner operation or control equipment, thus these gaseous pollutant emission rates will not differ from the current projection.

AQD #17 "A" & "B" Trona Ore Calciner Precipitators Common Stack

The AQD #17 stack emits the exhaust from both the "A" and "B" train trona calciners, currently rated to process 162 TPH of trona ore feed, each. As noted earlier, Solvay plans to increase that design feed rate up to 200 TPH trona feed on each unit by installing new higher speed bucket elevators at the outlet to improve product removal capacity. The burners on each of these calciners have an existing design firing capacity of 200 MM Btu/hr, however Solvay has indicated that they feel these units can operate over-design up to 250 MM Btu/hr in this service. Thus Solvay feels that the firing capacity of these burners is sufficient to adequately calcine the increased trona ore throughput. The burners are designed for "Low NO_x" performance and they had been rated for a NO_x emission rate of 0.05 lb/MM Btu. Subsequent internal testing has indicated to Solvay that a NO_x control performance of 0.06 lb/MM Btu, is more appropriate. Thus each calciner will move from 10 pph NO_x emissions (0.05 @ 200), up to 15 pph (0.06 @ 250), and the AQD #17 stack will have an allowable NO_x emission limit of 30.00 pph, based on both "A" and "B" calciner emissions. This works out to a 0.075 lb/ton ore feed factor considering the new 200 TPH design trona feed rate for each unit.

There are existing electrostatic precipitators for particulate emission control on each of these calciners. The revised ventilation system for the AQD #17 stack will be designed to handle 312,000 actual cubic feet per minute (120,424 dscfm) of exhaust through a 12 ft. diameter stack (2,759 ft/min exit velocity). Internal Solvay testing has indicated that the precipitators can handle this increased ore throughput, and still meet the current 22.30 pph particulate emission limit. Thus the outlet grain loading will be 0.022 grains per standard cubic foot of exhaust.

From plant testing on this source, Solvay has projected maximum VOC emissions from trona based emissions and gas firing, of 1.94 pounds per ton of ore throughput. For the former 162 TPH process rate, this works out to 314.28 pph for each calciner, while for the proposed 200 TPH maximum process rate, this works out to 388.00 pph for each unit. Thus the AQD #17 stack will now have a VOC emission rate of 776.00 pph.

CO emissions also exist from trona calcining, with some CO coming from the fuel combustion at the kiln burner, and a significant portion coming form partial combustion of the hydrocarbons driven off the trona ore in the hot environment of the calciner kiln. From plant testing on this sources, Solvay has projected maximum CO emissions from trona based emissions and gas firing, of 3.81 pounds per ton of ore throughput. For the former 162 TPH process rate, this works out to 617.22 pph for each calciner, while for the proposed 200 TPH maximum process rate, this works out to 762.00 pph for each unit. Thus the AQD #17 stack will now have a CO emission rate of 1524.00 pph.

AQD #18 & #19 Coal Boiler Scrubber & Precipitator Control Systems

Solvay currently operates a Flakt Spray Tower Flue Gas Desulfurization (FGD) Scrubbers and Flakt Type FAA 5x32-66120-2 Electrostatic Precipitators to control emissions from the exhaust of the 350 MM Btu plant coal fired boilers, designated sources AQD #18 and AQD #19. The industrial ventilation fans for these systems are designed for ~~143,676~~ 87,250 and 91,800 respectively actual cubic feet per minute ~~(103,500~~ dscfm) of exhaust air, leading to ~~7'4"~~ 7'3" diameter precipitator stacks (3,480 ft/min exit velocity). As mentioned in the project description, Solvay has committed to reducing permitted particulate emissions from these stacks as additional trade-off for new emission sources, based on recent internal testing and evaluation of control equipment capability by the Solvay technical staff. Solvay had projected emissions from the

142,800 and 149,000 respectively

and 3,600 respectively

boilers at 17.00 pph each, and that emission limit was included in past permits. In this current application, Solvay has certified that the boiler stacks will now meet a particulate emission rate of 5.00 pounds per hour, each. This works out to an outlet loading of approximately 0.0056 grains per dry standard cubic foot of exhaust (gr/dscf).

The stacks also emit SO_2 and NO_x emission limited to 70 and 245 pph, respectively. From plant testing on other similar sources, Solvay has determined total VOC emissions from this boiler to be fuel related, thus based on AP-42 emission factors, the unit emits 0.50 pph of VOC. No changes are planned for the boiler operation or control equipment, thus these gaseous pollutant emission rates will not differ from the current projection.

AQD #26 Alkaten Product Dryer Baghouse

Solvay currently has a model ~~PSTR-D-10-01 Peabody~~ M.RwPwl 289S-10-25TRH → 3,500 baghouse and industrial ventilation system to control particulate emissions from the existing Alkaten product dryer, designated source AQD #26. The industrial ventilation fan for this system is designed for 15,600 actual cubic feet per minute (11,700 dscfm) of exhaust air, leading to a 2'5" diameter baghouse stack (~~4,316~~ ft/min exit velocity). As mentioned in the project description, Solvay has recently identified NO_x emissions from a small 2.6 MM Btu/hr gas burner that provides heat to the Alkaten dried trona product kiln. Solvay has estimated NO_x emissions from AQD #26 at 0.25 pph, based on AP-42 for natural gas burning. Solvay has determined total VOC emissions from this dryer to be fuel related, thus based on AP-42 emission factors, they calculate that the unit emits 0.01 pph of VOC. This permit will codify the existence of these fuel related gaseous pollutants from this emission source at the Solvay plant.

No changes are planned for the Alkaten kiln operation, but Solvay had previously projected an emission rate from the Alkaten kiln operation at 1.10 pph; which was included in past permits as the AQD #26 particulate emission limit. Solvay has tested this stack, and from those results, the company is proposing that the Alkaten kiln stack now meet a revised particulate emission limit of 0.55 pounds per hour. This works out to an outlet loading of approximately 0.0055 grains per dry standard cubic foot of exhaust (gr/dscf).

AQD #47 Main Crusher Control Baghouse

Solvay currently has a model 640J-1020-TRH Mikro Pulsaire baghouse and industrial ventilation system to collect trona dust from transfer points and vents associated with the operation of the three existing hammermill crushers in the main crusher building, designated source AQD #47. As noted earlier, this source will be eliminated as part of this project, and by modifying the industrial ventilation system of source #2a, Solvay will control the emission points from these hammermills with the excess capacity of that #2a system.

AQD #48 "C" Trona Ore Calciner Precipitator

The "C" train trona calciner is currently rated to process 162 TPH of trona ore feed, but as noted earlier, Solvay plans to increase that design feed rate up to 200 TPH by installing new higher speed bucket elevators at the outlet to improve product removal capacity. The burners on this calciner have an existing design firing capacity of 200 MM Btu/hr, however Solvay has indicated that they feel this unit can

operate over-design up to 250 MM Btu/hr in this service. Thus Solvay feels that the firing capacity of these burners is sufficient to adequately calcine the increased trona ore throughput. The burners are designed for "Low NO_x" performance and as above, they had been rated for a NO_x emission rate of 0.05 lb/MM Btu. However, a NO_x control performance of 0.06 lb/MM Btu is now considered more appropriate. Thus the "C" calciner throughput change will increase NO_x emissions from 10 pph (0.05 @ 200), up to 15.00 pph (0.06 @ 250) for the AQD #48 stack. This works out to a 0.075 lb/ton ore feed factor considering the proposed 200 TPH design trona feed rate for this unit.

There is an existing electrostatic precipitator for particulate emission control on AQD #48, designed to handle 156,000 actual cubic feet per minute (60,212 dscfm) of exhaust through a 10'6" diameter stack (1,802 ft/min exit velocity). Internal Solvay testing has indicated that the precipitator can handle this increased ore throughput, and still meet the current 9.30 pph particulate emission limit. Thus the outlet grain loading will be 0.018 grains per standard cubic foot of exhaust.

From plant testing on this source, Solvay has projected maximum VOC emissions from trona based emissions and gas firing, of 1.94 pounds per ton of ore throughput. For the former 162 TPH process rate, this works out to 314.28 pph for each calciner, while for the proposed 200 TPH maximum process rate, the VOC emission rate from AQD #48 will be 388.00 pph.

CO emissions also exist from trona calcining, with some CO coming from the fuel combustion at the kiln burner, and a significant portion coming form partial combustion of the hydrocarbons driven off the trona ore in the hot environment of the calciner kiln. From plant testing on this sources, Solvay has projected maximum CO emissions from trona based emissions and gas firing, of 3.81 pounds per ton of ore throughput. For the former 162 TPH process rate, this works out to 617.22 pph for each calciner, while for the proposed 200 TPH maximum process rate, the CO emission rate from AQD #48 will be 762.00 pph.

ESP

AQD #51 Dryer 5 ~~Scrubber~~ Stack

Solvay currently controls particulate emissions on the DR-5 gas fired dryer exhaust stream using a model FAA 100-AL Flakt electrostatic precipitator, designated source AQD #51. The industrial ventilation fan for this system is designed for 100,000 actual cubic feet per minute (35,000 dscfm) of exhaust air, leading to an 8 ft. diameter baghouse stack (1,989 ft/min exit velocity). As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #51 stack by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #51 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 4.80 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this precipitator stack exhaust will meet an outlet emission loading of 0.008 grains/dscf of exhaust. At the currently specified 35,000 dscfm, this works out to a revised allowable particulate emission rate of 2.40 pounds per hour.

The stack also emits NO_x emissions limited to 18.00 pph. From plant testing on other similar sources, Solvay has determined total VOC emissions from this ~~boiler~~ dryer burner to be fuel related, thus based on AP-42 emission factors, the unit emits 0.28 pph of VOC. No changes are planned for the burner operation or control equipment, thus these gaseous pollutant emission rates will not differ from the current projection.

As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #44 baghouse by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #44 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 0.90 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust. At the currently specified 2,100 dscfm, this works out to a revised allowable particulate emission rate of 0.18 pounds per hour.

In another measure to reduce annual particulate emissions and demonstrate compliance with ambient standards, Solvay has proposed to limit the usage of this AQD #44 baghouse to 12 hours per day. Lime deliveries are not continuous and the baghouse is not needed full time. Thus 4380 hours of operation are considered in this analysis, which reduces the annual particulate emissions from AQD #44 to 0.39 TPY.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #46 East Ore Storage Building Reclaim Baghouse

Solvay currently has a model 420-CL-029B Mikro Pulsaire baghouse and industrial ventilation system to collect trona dust from transfer points associated with the ore reclaim operation from the existing east ore storage building, designated source AQD #46. As noted earlier, Solvay will eliminate baghouse AQD #2b as part of the project, with AQD #46 system absorbing the load of the existing AQD #2b pick-up points. Solvay feels that the AQD #46 industrial ventilation system has the capacity to add these points without sacrificing system control efficiency, and still maintain emissions within allowable limits.

This industrial ventilation system fan will be designed for 10,500 actual cubic feet per minute (8,275 dscfm) of exhaust air, leading to a 2.20 ft. diameter baghouse stack (2,762 ft/min exit velocity). As mentioned in the project description, Solvay has also committed to reducing permitted emissions from the AQD #46 baghouse by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #46 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 1.20 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust. At the currently specified 8,275 dscfm, this works out to a revised allowable particulate emission rate of 0.71 pounds per hour.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #50 "C" Train Dryer Area Housekeeping Baghouse

Solvay currently has a model 2805-10-20-TRH-C Mikro Pulsaire baghouse and industrial ventilation system to collect dust from transfer points associated with the "C" train dryer area soda ash handling operations, designated source AQD #50. The industrial ventilation fan for this system is designed for 26,000 actual cubic feet per minute (~~26,250~~ dscfm) of exhaust air, leading to a 4'6" diameter baghouse stack (1,635 ft/min exit velocity). As mentioned in the project description, Solvay has committed

16,500

to reducing permitted emissions from the AQD #50 baghouse by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #50 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 2.10 pph on this basis (system exhaust volume was specified differently in the past). Solvay has tested this stack, and from those results, the company is proposing that this dryer area soda ash handling baghouse stack now meet a revised particulate emission limit of 0.70 pounds per hour. This works out to an outlet loading of approximately 0.0050 grains per dry standard cubic foot of exhaust (gr/dscf).

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #53 Product Storage Silo Discharge Area Housekeeping Baghouse

Solvay currently has a model ~~130B~~ 1685-10-20-TRH-C Mikro Pulsaire baghouse and industrial ventilation system to collect soda ash dust from the product transfer points in the discharge area at the bottom of the existing soda ash storage, designated source AQD ~~#50~~ 53. As noted earlier, Solvay will eliminate baghouse AQD #69 as part of the project, with AQD #53 system absorbing the load of the existing AQD #69 pick-up points. Solvay feels that the AQD ~~#50~~ 53 industrial ventilation system has the capacity to control these additional points without sacrificing system control efficiency, and still maintain emissions within allowable limits.

This industrial ventilation system fan will be designed for 13,175 actual cubic feet per minute (10,500 dscfm) of exhaust air, leading to a 2.8 ft. diameter baghouse stack (2140 ft/min exit velocity). As mentioned in the project description, Solvay has also committed to reducing permitted emissions from the AQD #53 baghouse by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #50 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at ~~2.10~~ 0.9 pph on this basis (system exhaust volume was specified differently in the past). Solvay has tested this stack, and from those results, the company is proposing that this product silo reclaim baghouse stack now meet a revised particulate emission limit of 0.45 pounds per hour. This works out to an outlet loading of approximately 0.0050 grains per dry standard cubic foot of exhaust (gr/dscf).

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #64 Sulfite Blending Drumming Bin Vent Baghouse

Solvay currently has a model 16S-6-30B Mikro Pulsaire baghouse and industrial ventilation system to collect dust from the sulfite blending drumming bin vent, designated source AQD #64. This industrial ventilation system fan is designed for 1,130 actual cubic feet per minute (900 dscfm) of exhaust air, leading to a 6 inch diameter baghouse stack (~~4,583~~ 5,755 ft/min exit velocity). As mentioned in the project description, Solvay has also committed to reducing permitted emissions from the AQD #64 baghouse by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #64 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 0.15 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01

grains/dscf of exhaust. At the currently specified 900 dscfm, this works out to a revised allowable particulate emission rate of 0.08 pounds per hour.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

900

AQD #65 Sulfite Blending Bagging Machine Vent Baghouse

9

Solvay currently has a model PS-5-16-C Peabody baghouse and industrial ventilation system to collect dust from the sulfite blending bagging machine vent, designated source AQD #65. This industrial ventilation system fan is designed for 400 actual cubic feet per minute (325 dscfm) of exhaust air, leading to an * inch diameter baghouse stack (~~3[illegible]~~ ft/min exit velocity). As mentioned in the project description, Solvay has also committed to reducing permitted emissions from the AQD #65 baghouse by changing the basis on which the allowable limits are set. In past permits, Solvay had estimated emissions from AQD #65 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 0.06 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust. At the currently specified 325 dscfm, this works out to a revised allowable particulate emission rate of 0.03 pounds per hour.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #68 Combined Product Bagging Machine Trona Silo Housekeeping Baghouse

Under permit MD-282 Solvay proposed using a model 81S-10-20 Mikro Pulsaire bin vent baghouse and industrial ventilation system, designated source AQD #68, to collect dust from the vent of the trona silo feeding the combined product bagging machine. This industrial ventilation system fan is designed for 5,277 actual cubic feet per minute (4,145 dscfm) of exhaust air, leading to a 1.17' x 0.98' rectangular baghouse stack (4,602 ft/min exit velocity).

As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #68 baghouse by changing the basis on which the allowable limits are set. For MD-282, Solvay estimated emissions from AQD #68 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 0.41 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust. At the currently specified 4,145 dscfm, this works out to a revised allowable particulate emission rate of 0.36 pounds per hour.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #70 Combined Product Bagging Machine Sulfite Silo Bin Vent Baghouse

Under permit MD-282 Solvay proposed using a model 64S-10-20 Mikro Pulsaire bin vent baghouse and industrial ventilation system, designated source AQD #70, to collect dust from the vent of the sodium sulfite silo feeding the combined product bagging machine. This industrial ventilation system fan is designed for 4,021 actual cubic

foot per minute (3,159 dscfm) of exhaust air, leading to a 1.63' x 0.84' rectangular baghouse stack (2,937 ft/min exit velocity).

As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #70 baghouse by changing the basis on which the allowable limits are set. For MD-282, Solvay estimated emissions from AQD #70 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 0.41 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust. At the currently specified 3,159 dscfm, this works out to a revised allowable particulate emission rate of 0.27 pounds per hour.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

AQD #71 Combined Product Bagging Machine MBS Silo Bin Vent Baghouse

Under permit MD-282 Solvay proposed using a model 64S-10-20 Mikro Pulsaire bin vent baghouse and industrial ventilation system, designated source AQD #71, to collect dust from the vent of the meta-bisulfite (MBS) silo feeding the combined product bagging machine. This industrial ventilation system fan is designed for 4,021 actual cubic feet per minute (3,159 dscfm) of exhaust air, leading to a 1.63' x 0.84' rectangular baghouse stack (2,937 ft/min exit velocity).

As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #71 baghouse by changing the basis on which the allowable limits are set. For MD-282, Solvay estimated emissions from AQD #71 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits were set at 0.41 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust. At the currently specified 3,159 dscfm, this works out to a revised allowable particulate emission rate of 0.27 pounds per hour.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

soda ash digester bin

AQD #72 MBS Process Soda Ash Feed Bin Vent Baghouse

25S-8-20TR MikroPul

Under permit MD-282 Solvay proposed using a model ~~48BV36 Smoot bin vent~~ baghouse and industrial ventilation system, designated source AQD #72, to collect dust from the ~~vent of the MBS silo feeding the combined product bagging machine.~~ As noted earlier, Solvay will eliminate baghouse AQD #40 as part of the project, with that source's old 25S-8-20TR Mikro Pulsaire baghouse being transferred for service to the AQD new #72 system. This industrial ventilation system fan is designed for 1,300 actual cubic feet per minute (820 dscfm) of exhaust air, leading to an 8" diameter baghouse stack (3,724 ft/min exit velocity).

As mentioned in the project description, Solvay has committed to reducing permitted emissions from the AQD #72 baghouse by changing the basis on which the allowable limits are set. For MD-282, Solvay estimated emissions from AQD #72 at 0.02 grains per dry standard cubic foot of exhaust (gr/dscf), and particulate emission limits

were set at 0.14 pph on this basis (system exhaust volume was specified differently in the past). In this current application, Solvay is proposing to reduce the allowable for this source and has certified that this baghouse will meet an outlet emission loading of 0.01 grains/dscf of exhaust. At the currently specified 820 dscfm, this works out to a revised allowable particulate emission rate of 0.07 pounds per hour.

From plant testing on other similar sources, Solvay has predicted that total VOC emissions from trona based emissions will be negligible for this baghouse.

POLLUTANT EMISSION RATES:

Table I, attached as an appendix to the end of this analysis, lists all of the particulate, SO_2, NO_x and VOC emission sources at the Solvay plant. Table B summarizes the changes as shown in Table I (numbers vary slightly due to rounding).

Table B: Solvay Trona Plant Pollutant Emission Rate Changes (TPY)

Source	PM_{10}	SO_2	NO_x	VOC
Existing Solvay Trona Plant	482	618	2369	4639
Proposed "D" Line Expansion	89	0	236	2339
Current Proposed Modifications	-181	0	67	969
Bagging/MBS Modifications	-5	0	0	0
Totals	385	618	2672	7947

As can be seen from the table, Solvay currently is allowed to emit 482 TPY of particulate, 618 TPY of sulfur dioxide and 2369 TPY of nitrogen oxides. Not considered in past permitting actions, but also existing at the plant is a projected 4639 TPY of VOC emissions. Solvay plans on adding about 89 TPY of particulate, 236 TPY of NO_x, and 2339 TPY of VOC from equipment associated installed with the new "D" process line. Adjustments to the allowables of existing equipment and other small modifications results in the elimination of about 186 TPY of particulate, but add 67 TPY NO_x, and 969 TPY VOC's. Therefore after construction of the new equipment, the plant will be permitted a total emission about 385 TPY of particulate, 618 TPY of SO_2, 2672 TPY of NO_x, ~~and~~ 7947 TPY of VOC's x are the maximum expected emissions. (and

As noted earlier, the VOC's emitted from the trona plant contain individual pollutant species which are listed under Title III of the U.S. Clean Air Act Amendments of 1990, as hazardous air pollutants (HAP's). Table II breaks down the VOC emissions from the Solvay Plant, by emission source and by pollutant. Of the 1,814 pph VOC's projected from the plant, approximately 464 pph (2,033 TPY) of those compounds (26%) are HAP species. The HAP pollutants are emitted as 27 chemical compounds, with the largest single emission being represented by the pollutant 1,3 butadiene, at 118.51 pph (519.1 TPY). This is followed by ten other compounds with short term emissions greater than 10 pounds per hour. In order of magnitude, these are: 68.39 pph (299.6 TPY) of trichloroethylene, 54.59 pph (239.1 TPY) of xylene, 53.19 pph (233.0 TPY) of benzene, 36.54 pph (160.1 TPY) of 2-butanone, 32.15 pph (160.1 TPY) of hexane, 28.34 pph (124.1 TPY) of toluene, 23.32 pph (102.1 TPY) of 1,1,1 trichloroethane, 14.32 pph (62.7 TPY) of styrene, 12.11 pph (53.0 TPY) of ethylbenzene, and 10.72 pph (47.0 TPY) of acrylonitrile. According to Solvay's emission inventory, other pollutants emitted

at rates greater than one pound per hour but less than ten pounds per hour are methylene chloride, acetaldehyde, and acrolein.

NEW SOURCE PERFORMANCE STANDARDS (NSPS):

Subpart OOO

The trona plant handles sodium compounds, which are defined as "non-metallic minerals" under Subpart OOO of the NSPS section of the Wyoming Air Quality Standards and Regulations. Since the plant crushes and mills these sodium minerals, it is considered a "non-metallic mineral processing plant" under the definition in the regulation. Subpart OOO is applicable to "each crusher, grinding mill, screening operation, bucket elevator, belt conveyor, storage bin and truck/rail loadout". Therefore the baghouse dust collection systems proposed under this project are subject to the limitations of the regulation, including opacity and emission limits. Under Subpart OOO the particulate emissions from the plant housekeeping baghouses must be held to within 0.05 grams per dry standard cubic meter (g/dscm) of baghouse exhaust and must have visible emissions within 7% opacity.

The 0.05 g/dscm rate is equivalent to 0.02 grains per dscf. Since all newly constructed or modified housekeeping dust control systems will meet an emission limit of 0.01 gr/dscf, the particulate ceiling of the regulation is met. A permit condition will insure that Solvay meets these emission and opacity limits.

Subpart Dc

The Division has reviewed the applicability of NSPS Subpart Dc and finds that the section applies to the proposed 100 MM Btu/hr gas fired boiler because the unit is a new facility sized between 10 and 100 MM Btu/hr. Under Subpart Dc, standards for particulate and sulfur dioxide emissions apply only to those boilers that fire coal. The only Subpart Dc requirements for those boilers that fire other fuels are administrative notification requirements contained in subparagraph 60.48c. Under that section the owner/operator of a new boiler is required to submit notification of the dates of construction, anticipated and actual start-up, with confirmation of the design heat input capacity and fuels to be combusted. This permit will contain State of Wyoming requirements that mandate compliance with these provisions.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT):

Solvay has conducted a "Top Down" BACT review of emission controls for this plant expansion, and the Division has determined that they have selected the most stringent controls available for all proposed operations.

Particulate Emissions

★ Calciner ★

As noted earlier, Solvay is proposing to use an electrostatic precipitator, designated source AQD #80, to control particulate emissions from this calciner stack. Solvay has certified that this precipitator will meet an outlet particulate loading of 0.015 grains per dry standard cubic foot of exhaust. At the exhaust rate of 95,300 dscfm, this works out to a particulate emission rate of 12.25 pounds per hour. With a design trona feed rate of 275 TPH, this calciner particulate emission rate then works out to a factor of 0.045 lb/ton of trona feed.

increment consumption analysis, therefore at that time, 0.98 TPY remained toward the "net emissions increase" calculation for PSD particulate increment consumption at the Solvay plant.

As noted, under this project Solvay is proposing to retire ore reclaim baghouse AQD #2b, sulfite product bagging baghouse AQD #40, and crusher building baghouse AQD #47 from service; eliminating the particulate allowable limits for these sources from the plant emission inventory. They also will abandon plans for the MD-282 permitted AQD #69 soda ash bagging silo bin vent, but no credit accrues under PSD regulations for the AQD #69 action because this source was never constructed, thus actual emissions over the last two years were zero.

As further particulate emission reduction, Solvay is proposing to reduce plant allowable particulate emissions from existing source AQD #'s 6b, 10, 11, 14, 41, 44, 46, 64 and 65 by basing emission loadings on 0.01 gr/dscf predicted emissions, rather than on 0.02 gr/dscf as had been considered for these units in past permits. The AQD #15 soda ash dryer stack and the AQD #73 meta-bisulfite dryer stack will take a slightly lower reduction, down to 0.015 gr/dscf. They also planned to reduce plant allowable particulate emissions from five other existing plant sources based on internal testing showing lower actual emissions than the former allowable emission limits. The allowables for the two coal boilers (AQD #18 & 19), the AQD #26 Alkaten dryer, the AQD #50 "C" train dryer area housekeeping baghouse, and the AQD #51 silo reclaim baghouse will all be set under 0.006 gr/dscf, while the testing on the "C" train AQD #51 gas fired dryer showed that an emission rate of 0.008 gr/dscf is most appropriate.

In this application, Solvay is also proposing to reduce plant allowable particulate emissions from four sources permitted under the latest permit, MD-282, ~~but not yet constructed~~. These sources are AQD #'s 68, 70, 71 and 72, and the reductions would again be accomplished by basing emission loadings on 0.01 gr/dscf predicted emissions, rather than on 0.02 gr/dscf. As with AQD #69, no credit accrues under PSD regulations for this action because these baghouses were never constructed, thus actual emissions over the last two years were zero.

The accounting of the particulate PSD credit due Solvay is shown in Table C.

♦ PSD Nitrogen Oxide Accounting ♦

Permit changes occurring after the 1977 effective date of the PSD regulations at the Solvay plant include the following permits and waivers:

Permit Number	Date Issued	Project Description
CT-234	Jul '79	initial construction of a 1 MM TPY soda ash plant
CT-234A	Dec '81	AQD #16 stack parameter modifications
CT-234A2 (OP-154)	Sep '84	address as-built modifications to 1 MM TPY plant
CT-643	Sep '85	initial design for construction of the Alkaten plant
CT-643A (OP-181)	Jul '86	revised plans for construction of the Alkaten plant
MD-117 (OP-257)	Feb '90	caustic/sodium sulfite facility & DR-4 fluid bed drier
MD-132 (OP-258)	Nov '90	"C" soda ash product line → 2 MM TPY plant capacity
T-200 Waiver	Feb '92	construct T-200 Alkaten storage bin & AQD #54 baghouse
CT-946	Mar '92	calcined trona project (project was mostly abandoned)
MD-229	Jun '95	conversion of "A" & "B" trona calciners to gas firing
MD-282	May '96	construction of a meta-bisulfite production facility

The NO_x increments were not effective until February '88 (increments established 2/8/88; minor source baseline date for Wyoming triggered 2/26/88), therefore under PSD regulation, emissions from MD-117 and subsequent permits, are the only emissions counted when assessing NO_x increment consumption.

NO_x emission sources constructed after the 1988 NO_x baseline date include the AQD #33 sulfite sulfur burner (1.50 pph), the AQD #48 "C" ore calciner (10.00 pph), the AQD #51 DR-5 soda ash dryer (18.00 pph), the AQD #73 MBS product dryer (0.15 pph), and twin 6 MM Btu/hr supplemental heat duct burners in the inlet ducts of the "A" & "B" line steam tube dryers which exhaust to the AQD #15 stack (1.20 pph). Totaling these emissions results in 30.85 pph, or 135.12 TPY NO_x increment consumption.

Solvay did accumulate a credit for converting their "A" & "B" calciners to gas under MD-229 in 1995, the Division has determined that they did not "use" that credit at that time because the new sources constructed under that project did not result in a "significant" increase, thus the project was not subject to PSD regulations. Under MD-282, the company elected not to "use" the NO_x credit to offset sources constructed for the MBS plant. The term for "contemporaneous" use of a decrease is defined by Section 24(a)(xii)(B) as five years from the date that actual emissions were reduced. As the A" & "B" calciner gas conversion was completed and operation began in October '95, while Solvay's current application was received in June '97, they are within the regulatory time frame to use that emission credit.

The accounting of the NO_x PSD credit due Solvay is shown in Table F.

Table F: Solvay Actual NO_x Emissions Offset Credit

Emission Sources	Operating Hours			Emission Credit	
	Affected Years	Hours	2 Year Average	actual pph	actual TPY
Nitrogen Oxides					
AQD #17 gas conversion	1993-94	8430/8575	8503	161.00	684.49

Section 24(a)(xii)(C) of the Wyoming Air Quality Standards & Regulations, limits the use of a "contemporaneous net emission decrease" to only one application. Therefore the "excess" NO_x credit of -126.52 TPY NO_x, cannot be used again in future application to offset any other projects which have NO_x increases

♦ PSD VOC Accounting ♦

Permit changes occurring after the 1977 effective date of the PSD regulations at the Solvay plant include the following permits and waivers:

Permit Number	Date Issued	Project Description
CT-234	Jul '79	initial construction of a 1 MM TPY soda ash plant
CT-234A	Dec '81	AQD #16 stack parameter modifications
CT-234A2 (OP-154)	Sep '84	address as-built modifications to 1 MM TPY plant
CT-643	Sep '85	initial design for construction of the Alkaten plant
CT-643A (OP-181)	Jul '86	revised plans for construction of the Alkaten plant
MD-117 (OP-257)	Feb '90	caustic/sodium sulfite facility & DR-4 fluid bed drier
MD-132 (OP-258)	Nov '90	"C" soda ash product line → 2 MM TPY plant capacity
T-200 Waiver	Feb '92	construct T-200 Alkaten storage bin & AQD #54 baghouse
CT-946	Mar '92	calcined trona project (project was mostly abandoned)
MD-229	Jun '95	conversion of "A" & "B" trona calciners to gas firing
MD-282	May '96	construction of a meta-bisulfite production facility

Because this plant was not constructed until 1982, after the 1977 effective date of the PSD regulations, all of the emissions from the facility consume PSD increment.

The MD-282 permit analysis provides an update of the PSD status for the Solvay Green River plant, showing the list of sources that were in place after that project. Although VOC emission totals were not shown in that analysis, a review based on currently defined VOC emission rates of that source list shows that there were potentially 4639.30 TPY of VOC emissions ~~permitted~~ from the plant. VOC emissions had not been considered in the past PSD increment consumption analyses, therefore at that time, all plant emissions count toward the "net emissions increase" calculation for PSD VOC increment consumption at the Solvay plant.

As noted, under this project Solvay is proposing to retire ore reclaim baghouse AQD #2b and sulfite product bagging baghouse AQD #40 from service; and will also abandon plans for the MD-282 permitted AQD #69 soda ash bagging silo bin vent. These emission sources have no VOC emissions, therefore there is no credit due for their elimination.

As noted previously, under this permit Solvay intends to increase the trona ore throughput on the calciners exhausting to AQD #17 and AQD #48 stacks. VOC emissions are a function of throughput, figured at 1.94 pounds per ton of throughput on these two stacks. Thus AQD #17 will increase VOC emissions by 147.44 pph (162 TPH ore throughput, increased to 200 TPH on both "A" & "B" calciner), while AQD #48 will increase VOC emissions by 73.72 pph (162 TPH ore throughput, increased to 200 TPH on "C" calciner), for a total increase of 221.16 pph, or 968.68 TPY. Actual emissions for the two sources for the past two years are 2,678.61 TPY for AQD #17 (628.56 pph @ 8523 average hours operation 1995-1996), and 1,274.56 TPY for AQD #48 (314.28 pph @ 8111 average hours operation 1995-1996).

New equipment installed under this permit adds a total of 2,239.10 TPY of VOC.

Table J: Solvay PSD Net Emissions Changes (Carbon Monoxide TPY)						
	Average Actual Emissions		Permitted Emission		Net Change	
Source	2 Year Avg	Record Year	Existing	Modified	Permitted	Actual
Contemporaneous Decreases						
no available decreases	0.00	n.a.	0.00	0.00	0.00	0.00
Total Decreases	0.00	n.a.	0.00	0.00	0.00	0.00
PSD Increases						
AQD #17 → 400 TPH	5260.57	'95-96	5406.85	6675.12	1268.27	1414.55
AQD #48 → 200 TPH	2503.14	'95-96	2703.42	3337.56	634.14	834.42
"D" Train Expansion	n.a.	n.a.	0.00	4689.89	4689.89	4689.89
Total Increases	7763.71	n.a.	8110.27	14702.57	6592.30	6938.86
Subtotal, Increment Consuming Emissions This Project					6592.30	6938.86
Total Increment Consuming Emissions Considered in Last Analysis (current)						8290.81
Subtotal Solvay Increment Consuming Emissions						15229.67
Subtract Emissions Considered in Previous Increment Analysis						0.00
Net Particulate Emissions Change (since last PSD Analysis)						15229.67

As can be seen, there were 8,290.81 TPY of CO ~~emission~~ increment consuming emissions at the plant previously, therefore for the purpose of calculating the "net emissions increase" for this project, PSD CO emissions at Solvay are now 15,229.67 TPY for comparison against the Section 24(a)(xxi)(A) significance threshold. The current 14,883.11 TPY plant CO emission total represents the full applicable PSD CO emission consumption at the Solvay plant to date.

♦ PSD Summary ♦

The following table shows the projected emission changes for the new ~~Unit 6~~ "D" Train plant equipment as compared with the "significance levels" contained in Section 24 (a)(xxi)(A) of the Wyoming Air Quality Standards & Regulations.

Table of Significance for PSD Applicability
Solvay "D" Train Plant Emissions (TPY)

Pollutant	Projected Emission Increase	Significant Emission Rate	Significant?
TSP	31	25	Yes
PM_{10}	31	15	Yes
NO_x	-127	40	No
VOC	3308	40	Yes
CO	6592	100	Yes

The 1996 PM_{10} monitoring data from the four downwind trona production facilities reveals that the ambient air quality in this region was in compliance with all applicable PM_{10} ambient standards during the calender year of 1996. Based on the compliance monitoring in this region and the results of this analysis, the Division is satisfied that the proposed increase in allowable PM_{10} emissions, and the existing PM_{10} sources at Solvay Minerals facility will not contribute to any significant impacts at the other trona production facilities.

♦ Sulfur Dioxide (SO_2) ♦

The applicant modeled SO_2 emissions from this facility to determine compliance with the 3-hour, 24-hour and annual Wyoming Ambient Air Quality Standards of 1300, 260, and 60 $\mu g/m^3$, respectively. The HSH modeled 3-hour and 24-hour ambient SO_2 concentrations were 446.21 $\mu g/m^3$ and 79.00 $\mu g/m^3$, respectively; the maximum modeled annual SO_2 concentration was 15.11 $\mu g/m^3$. The results of this analysis indicate that model predicted concentrations of SO_2 from this facility are well below the applicable NAAQS. Based on the results of this analysis, the Division is satisfied that the NAAQS for SO_2 will be protected.

Hazardous Air Pollutants (HAPs) Analysis: The applicant submitted a modeling analysis for HAPs based on average tested HAP emission rates from the three existing Calciners. Testing was conducted during November 1996, using a gas chromatograph/mass spectrometer to provide an accurate identification of the speciated VOCs; the test results are provided in the permit application in Tables 3-2, 3-3, 3-4 and 3-5. The average tested emission rate for each HAP is shown along with a corresponding maximum emission rate which was derived to include three standard deviations. The A and B Calciners (AQD #17) ~~were tested at the combined production rate of 400 tons per hour (TPH)~~ and Calciner C (AQD #48) ~~was tested at 200 TPH~~. The HAP emission rates for the proposed "D" Calciner (AQD #80) were estimated based on the tested emission rates of the existing Calciners at their respective production rates, and the average of the ratioed values was used to reflect the proposed 275 TPH production rate of the "D" Calciner.

EPA Reference Methods 18 and 25A were used for determining VOC emission rates, and EPA Reference Methods 0010, 0011, and 0030 were used for determining HAP emission rates. EPA Reference Methods 0010, 0011, and 0030 are reference methods that were developed for analyzing volatile and semi-volatile organic compounds and are recognized by the Division as acceptable methods for analyzing HAPs in conjunction with EPA Reference Methods 18 and 25A.

An ambient air impact was completed for each of the twenty-seven (27) HAPs listed in Table II. The applicant's modeling analysis was completed using HAP emission rates based test data for the existing calciners, projected emission rates from the new calciner and the mine vent exhaust. EPA's ISCST3 model was used to assess short-term concentrations of each of the HAPs; the models were run using a 500-meter coarse receptor grid centered over the facility in a 21x21 matrix. The modeled concentrations predicted by this analysis are shown in Table III. The modeled HAP concentrations were compared to the lowest and highest listed Acceptable Ambient Level (AAL) for twenty-two (22) HAPs found in EPA's National Air Toxics Clearinghouse (NATICH) data base; this data base lists AALs for 1-hour, 8-hour, 24-hour, and annual averaging periods for various states in the United States. The HAPs which exceeded the minimum AALs on an annual basis were 1,3 butadiene, benzene, formaldehyde and acrylonitrile; modeled concentrations of 1,3 butadiene were also found to exceed the minimum AAL for the 1-hour and 24-hour averaging periods, and modeled concentrations of benzene and formaldehyde were also found to exceed the minimum AAL over a 24-hour averaging

were tested to develop a "pound of pollutant per ton of ore calcined" emission rate.

7. Solvay will operate the Green River plant trona calciner and dryers at production rates which do not exceed the rates listed in the following table.

Unit	Calciner Kilns: Trona Ore Feed Rate (TPH)	Calciner Kilns: Calcined Ore Production Rate (TPH)	Trona Ore Feed Rate Capacity @ Full Load (MMTPY)	Design Annual Trona Ore Feed Rate (MMTPY)
#17 "A" Calciner	200	147	1.752	1.577
#17 "B" Calciner	200	147	1.752	1.577
#48 "C" Calciner	200	147	1.752	1.577
#80 "D" Calciner	275	202	2.409	2.048
Totals	875	643	7.665	6.779

Unit	Dryer Kiln: Wet Crystal Feed Rate (TPH)	Dryer Kiln: Soda Ash Production Rate (TPH)	Soda Ash Production Capacity @ Full Load (MMTPY)	Design Annual Soda Ash Production (MMTPY)
#15 DR-1 Dryer	93	76	0.666	0.594
#15 DR-2 Dryer	93	76	0.666	0.594
#28 DR-4 Dryer	40	32	0.280	0.252
#51 DR-5 Dryer	150	122	1.069	0.962
#82 DR-6 Dryer	198	161	1.410	1.199
Totals	~~363~~ 574	~~458~~ 467	4.091	3.601

8. Maximum soda ash production at the Solvay soda ash plant will be limited to 3.60 million tons per year, from no more than 6.78 million tons per year of trona ore throughput.

9. The allowable particulate, sulfur dioxide and nitrogen oxide mass emission rates for Solvay [redacted] Plant emission sources shall be limited to rates shown in Table I of this analysis.

10. Solvay will meet all applicable provisions of New Source Performance Standards Subpart OOO as they apply to the newly constructed equipment in the "D" process train. Thus baghouses AQD #'s 76, 79, 81 and 83 must maintain particulate emissions within 0.02 grains per dry standard cubic foot (gr/dscf) of baghouse exhaust and must hold visible emissions to within seven (7%) opacity.

11. Solvay will meet all applicable provisions of New Source Performance Standards Subpart Dc requirements as they apply to the newly constructed AQD #85 boiler. Under that section the owner/operator of a new boiler is required to submit notification of the dates of construction, anticipated and actual start-up, with confirmation of the design heat input capacity and fuels to be combusted.

12. The allowable opacity limits for AQD #80 calciner and AQD #82 dryer will be set based on correlation of the units' COM measured opacity during their initial performance testing and first 6 months of operating opacity data. Solvay shall submit a summary of opacity readings during the first 6 months of operation summarizing the monitored opacity readings in increments of 5 percent up to 20